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YAKIMA BASIN COMPREHENSIVE REPORT, BENTON, KITTITAS, AND YAKIMA COUNTIES, WASHINGTON. ECONOMIC BASE ANALYSIS AND PROJECTION, 1960-2010

Public Health Service
Portland, Oregon

December 1964

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COLUMBIA RIVER BASIN PROJECT
For Water Supply and Water Quality Management

YAKIMA BASIN COMPREHENSIVE REPORT
BENTON, KITTITAS, AND YAKIMA COUNTIES, WASHINGTON
ECONOMIC BASE ANALYSIS AND PROJECTION
1960 - 2010

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Region IX

Division of Water Supply and Pollution Control
570 Pittock Block
Portland 5, Oregon

YAKIMA BASIN COMPREHENSIVE REPORT
Benton, Kittitas, and Yakima Counties, Washington

ECONOMIC BASE ANALYSIS AND PROJECTION
1960 - 2010

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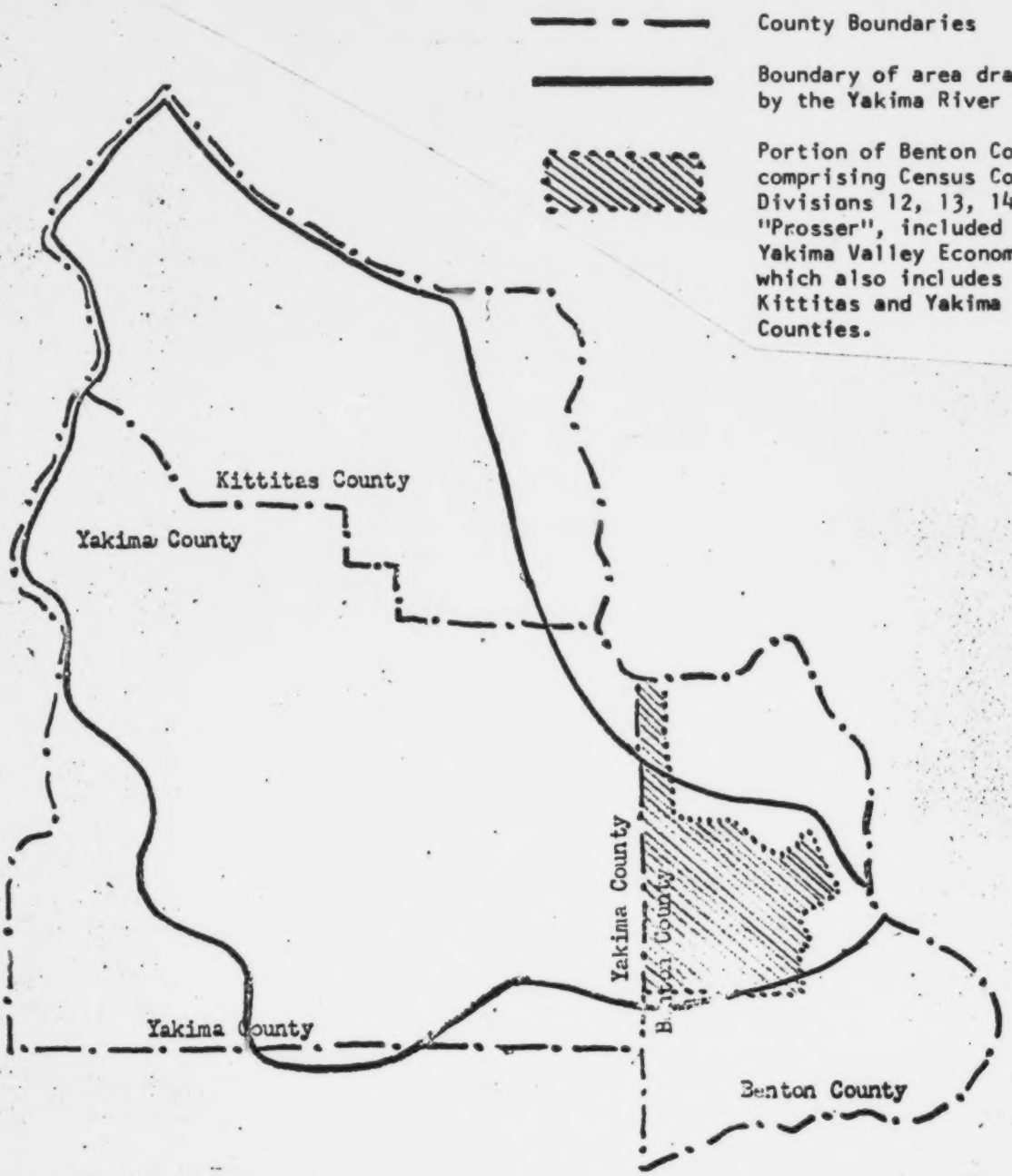
A. The Economic Base Study Area

Because most economic data are available only on a county basis, a Yakima 3-County Area, defined to include all of Kittitas, Yakima, and Benton Counties, is the primary area for economic analysis. This 3-County Area, however, includes a substantial part of Benton County lying outside the agriculturally important portion of the basin. The intense agricultural development of the "Yakima Valley" terminates just below Benton City. But Benton County's two largest cities and also the economically important Hanford Atomic Works are in the remaining portion of the county below that point. For this reason, an economic study area called the Yakima Valley has been delineated. The Yakima Valley is defined to include all of Kittitas and Yakima Counties[1/] plus Benton County's 1960 census divisions 12, 13, 14 and "Prosser". These Benton County census divisions comprise the closest approximation, in terms of available statistical units, to that part of the county within the agricultural Yakima Valley. Figure 1 shows the location of the Benton County census divisions included in the Yakima Valley, as defined here.

1/ The political boundaries of Kittitas and Yakima Counties conform closely to the topographic boundary of the physical basin. A strip of Kittitas County along the Columbia River and the southwestern corner of Yakima County are outside the physical basin, but these areas are undeveloped and almost uninhabited, so that no significant distortion is introduced by using these county lines as the boundary of the area for economic analysis of the basin.

FIGURE 1
YAKIMA VALLEY ECONOMIC AREA AND YAKIMA 3-COUNTY AREA
IN RELATION TO THE AREA DRAINED BY THE YAKIMA RIVER


County Boundaries
Boundary of area drained by the Yakima River
Portion of Benton County, comprising Census County Divisions 12, 13, 14, and "Prosser", included in the Yakima Valley Economic Area, which also includes all of Kittitas and Yakima Counties.
Kittitas County
Yakima County
Yakima County
Benton County
Yakima County
Benton County

B. Present Economic Base and Population

1. Economic Activities

Employment, by industry, in the 3-County Area in 1960 is shown in Table 1. Table 2 shows the percent of the total labor force in each industry group in the Yakima 3-County Area, and compares that distribution with the Seattle Region and with the U. S. as a whole. An estimated distribution for the Yakima Valley is also shown. The difference between the employment pattern in the Yakima Valley and the 3-County Area is mainly the result of the inclusion in the latter of the Hanford Atomic Works and various industries that have grown up as a result of it in Richland and Kennewick. In the industrial classification, the Hanford Atomic Works, with more than 6,000 employees, is classified as a "chemical" industry.

The comparisons in Table 2 show that the economic base of the Yakima Valley depends primarily upon specialization in agriculture and food processing. There is also more employment in trucking, warehousing and wholesale trade than would be expected on the basis of the employment pattern in the Seattle Region and in the U. S. This is due to food-processing activities, and to the fact that the city of Yakima acts as a collection and distribution center for a somewhat larger area than the three counties. There is also above "normal" employment in education, resulting from the Central Washington State College at Ellensburg and a junior college at Yakima. The larger than "normal" employment in construction is not considered

TABLE I

LABOR FORCE, BY INDUSTRY GROUP, YAKIMA 3-COUNTY AREA, APRIL 1960

Industry Group	Individual Counties			3-County Total
	Benton	Kittitas	Yakima	
Agriculture	1832	1224	12155	15211
Forest management; fisheries	9	45	37	91
Mining	3	110	34	147
Manufacturing, Total	8097	629	6069	14795
Logging, lumber, wood pr.,furn.	17	269	951	1237
Primary & fabric. metals	48	45	138	231
Machinery, incl. electrical	31	20	317	368
Other durable goods	109	43	491	643
Food and kindred products	423	195	2657	3275
Textiles and apparel	13	0	340	353
Printing, publishing, and allied	272	53	560	885
Chemical and allied	7097[a]	0	297	7394[a]
Other non-durables, & misc. mfrs.	87	4	318[b]	409[b]
Construction	2179	825	3101	6105
Truck transp. and warehousing	189	142	1514	1845
R.R. & other transportation	426	154	689	1269
Wholesale trade	311	205	3051	3567
Retail trade	2770	1246	7472	11488
Education	1239	938	2491	4668
All other services[c]	4605	1617	11628	17850
Industry not reported	412	136	773	1321
Total Employed Civilian Labor Force	22072	7271	49014	78357
Military	826	24	281	1131
Total Employed Labor Force	22898	7295	49295	79488
Unemployed	1561	653	5563	7777
TOTAL LABOR FORCE	24459	7948	54858	87265

a/ More than 6000 of these employees were at the Hanford Atomic Works.
b/ Includes 213 in "Pulp, Paper, and Allied Products", according to Washington State covered employment data for April 1960.
c/ Includes communications and utilities; finance, insurance, real estate, business and repair services; personal services, private household workers, entertainment and recreation; professional and related services; and public administration.

Source: U. S. Census of Population, 1960.

TABLE 2

COMPARATIVE DISTRIBUTION OF LABOR FORCE, BY INDUSTRY GROUP, APRIL 1960
(As Percent of Total Labor Force)

Industry Group	Yakima Valley a/	3-County Area b/	Seattle Region c/	United States
Agriculture	21.3	17.4	4.5	6.1
Forest management; fisheries	.1	.1	.5	.1
Mining	.2	.2	.1	.9
Manufacturing, Total	10.6	17.0	24.1	25.1
Logging, lumber, wood pr., furn.	1.9	1.4	5.0	1.5
Primary and fabricated metals	.3	.3	1.6	3.6
Machinery, incl. electrical	.5	.4	1.1	4.4
Other durable goods	.8	.8	8.6 d/	4.6
Food and kindred products	4.5	3.8	2.6	2.6
Textiles and apparel	.6	.4	.6	3.1
Printing, publishing and allied	1.0	1.0	1.3	1.6
Chemical and allied	.5	8.5 e/	1.1	1.2
Other non-durables, and misc. mfrs.	.5	.4	2.2	2.5
Construction	6.3	7.0	5.8	5.5
Truck transp. and warehousing	2.6	2.1	1.2	1.3
R.R. and other transportation	1.3	1.5	3.1	2.6
Wholesale trade	5.2	4.1	3.7	3.2
Retail trade	13.9	13.2	13.5	13.7
Education	5.5	5.3	5.2	4.8
All other services f/	21.2	20.4	24.8	25.5
Industry not reported	1.4	1.5	2.6	3.7
Total Employed Civilian Labor Force	89.6	89.8	89.1	92.5
Military	.5	1.3	4.6	2.5
Unemployed	9.9	8.9	6.3	5.0
TOTAL LABOR FORCE	100.0	100.0	100.0	100.0

a/ Based on the distribution in Kittitas and Yakima Counties. It is assumed that the portion of Benton County included in the Yakima Valley has an employment pattern similar to the other two counties.
b/ Includes all of Benton, Kittitas and Yakima Counties.
c/ Defined as Washington State, less 5 counties in southwestern Washington (in the Portland Region) and 15 counties in eastern Washington (in the Spokane Region.
d/ Includes the Boeing Co. at Seattle.
e/ Includes the Hanford Atomic Works.
f/ See Table 1, note c.

Source: U. S. Census of Population, 1960.

to be part of the permanent economic base but to result principally from unusual building activity in the area at the time of the 1960 census.[1/]

Tables 3 through 7 provide data on the agricultural economy of the Yakima 3-County Area. Of the 526,000 acres of cropland harvested in 1959, 345,000 were irrigated. In addition to this cropland irrigated, 113,000 more acres of land in uses other than for crops (pasture, etc.) were irrigated. Most of the irrigation is provided through organized irrigation districts rather than by on-farm sources. The principal crops grown in the Yakima Basin are shown in Table 6. With the exceptions of winter wheat and barley, nearly all crops are grown only on irrigated land. These provide the raw material for the basin's important food-products manufacturing industry. As shown in Table 6, orchards are a major component in the agricultural economy. Livestock and poultry are also important in the basin. Dairy, meat and poultry products from the Yakima Valley are shipped to cities throughout the Northwest, particularly to the populous Puget Sound area. Table 7 shows the populations of the principal domestic animals, by county. From 1954 to 1959, there was some decrease in the number of milk cows in the 3-County Area, but other cattle increased. There was a large increase, percentagewise, in hogs and pigs from 1954 to 1959, and a small decrease in the number of poultry.

1/ Construction activity at Wanapum Dam was near its peak in 1960, while at Priest Rapids Dam final construction, including installation of generators, was still under way. Employees at these two sites, most of whom lived in Kittitas and Yakima Counties, would account for much of the above-average employment in construction in the 3-County Area.

As can be seen from the acreage figures for each of the three counties, shown in Table 6, the heart of the Yakima Valley is Yakima County. Yakima County is the leading county in Washington State in value of farm products sold. It ranks first in the state in production of tree fruits, grapes, sugar beets, vegetables, cattle, sheep and turkeys. It is also the leading county in the Nation in production of apples, hops, and mint.1/

1/ Yakima County Agriculture, Washington State Dept. of Agriculture, 1964, p. 4.

TABLE 3

LAND IN FARMS, BY TYPE OF USE, YAKIMA 3-COUNTY AREA[a/]

In Thousands of Acres

Type of Use	1954	1959
Cropland harvested	509	526
Cropland fallow, etc.	199	215
Pasture:		
Cropland used for pasture	74	102
Woodland used for pasture	418	499
Pasture and range land	1098	1527[b/]
Woodland	11	31
Other land in farms (roads, lots, etc.)	100	128
TOTAL LAND IN FARMS	2409	3028

a/ Includes all of Benton, Kittitas and Yakima Counties.

b/ Factors contributing to the large increase in "pasture and range land" were: (1) the opening up of a portion of the Yakima Firing Range to grazing; (2) re-opening to grazing of parts of the Indian reservation which had been closed because of over-grazing, but where range grasses had become re-established; and (3) opening to grazing of logged-off areas after grass had become established.

Source: U. S. Census of Agriculture, 1959, Washington State volume, Table 1, page 142.

TABLE 4

IRRIGATED ACREAGE IN YAKIMA 3-COUNTY AREA[a/]

Type of Land Use	Acres Irrigated, Thousands 1954	1959
Cropland irrigated	323	345
Other land irrigated (pasture, etc.)	109	113
TOTAL IRRIGATED LAND	432	458[b/]

a/ Includes all of Benton, Kittitas and Yakima Counties.
b/ Of this total, 23,000 acres were irrigated by sprinkler only.

Source: U. S. Census of Agriculture, 1959, Table 1a.

TABLE 5

SOURCE OF WATER FOR IRRIGATED ACREAGE, YAKIMA 3-COUNTY AREA, 1959[a/]

Source of Water	Acres, Thousands
Ground water (source on farm) only	6
Surface source (source on farm, not part of irrigation organization)	19
Irrigation organization only	370
Both farm ground water and farm surface water	2
Both irrigation organization and farm ground or farm surface water	61
TOTAL IRRIGATED ACREAGE, 1959	458

a/ Includes all of Benton, Kittitas and Yakima Counties.

Source: U. S. Census of Agriculture, 1959, Table 1a.

TABLE 6

ACREAGE HARVESTED, BY PRINCIPAL CROPS, YAKIMA 3-COUNTY AREA, 1959 a/

In Thousands of Acres

Type of Crop	Crops Harvested from Irrigated Acreage				Total Acreage, Including non-irrigated, 3-County Total
	Individual Counties			3-County Total	
	Benton	Kittitas	Yakima		
Corn	5.7	.9	41.5	48.1	49.3
Winter wheat	.9	.3	.4	1.6	113.8
Spring wheat	2.5	5.4	9.0	16.9	23.7
Oats	.6	5.9	2.0	8.5	9.6
Barley	.7	1.9	6.1	8.7	35.6
Beans, dry field and seed	1.1	-	-	1.1	1.1
Peas, dry field and seed	.1	.6	.2	.9	.9
Hay	8.9	42.8	44.9	96.6	104.1
Hops	1.3	-	17.0	18.3	18.3
Potatoes	2.3	1.3	4.5	8.1	8.2
Sugar Beets	2.1	.8	14.4	17.3	17.3
Asparagus	1.7	-	10.2	11.9	11.9
Sweet corn	.3	2.3	8.1	10.7	10.9
Tomatoes	-	-	1.1	1.1	1.1
Green peas	.8	.3	1.5	2.6	2.6
Orchards & vineyards	5.6	.2	61.4	67.2	69.0
Misc. & not classified	5.7	.2	19.8	25.7	48.4
TOTAL	40.3	62.9	242.1	345.3	525.8

a/ Includes all of Benton, Kittitas and Yakima Counties.

Source: U.S. Census of Agriculture, 1959, Washington State volume, Table 11a, page 206.

TABLE 7

LIVESTOCK & POULTRY ON FARMS, YAKIMA 3-COUNTY AREA, 1954 and 1959

	Individual Counties						3-County Total	
	Benton		Kittitas		Yakima			
	1954	1959	1954	1959	1954	1959	1954	1959
Milk cows	3630	2856	6132	4653	16882	12257	26644	19766
Other cattle	19549	19958	57364	59003	106574	119250	183487	198211
Hogs & pigs	3142	6272	1698	2167	14077	17197	18917	25636
Chickens	57039	45110	45398	41975	238768	247418	341205	334503

Source: U. S. Census of Agriculture, 1959, County Table 8.

2. Population

The population of the Yakima Valley was about 177,000 in 1960, and the population of the 3-County Area was about 228,000. The difference is due to the exclusion from the Yakima Valley of the most populous parts of Benton County, as shown in Table 8. Of the 177,000 in the Yakima Valley, 145,000 were in Yakima County. Data are also presented in Table 8 for a "Yakima Urban Area", which includes the suburban development surrounding the city of Yakima, as well as the population within the incorporated limits of the city. The boundaries used for this Urban Area are described in footnote "b" of Table 8.

Population trends during the 1950-60 decade were as follows:

Yakima County--Population increased about 10,000 during the 1950-60 decade. About half of this increase was within the city of Yakima. The rest of the growth was distributed among nine other incorporated places in the county. The population in the unincorporated area remained about constant, but this population is relatively large, reflecting the importance of agriculture in the county. The average annual compound rate of growth during 1950-60 was 0.7 percent in Yakima County, compared with 0.6 percent in the Yakima Basin, 0.8 percent in the 3-County Area, and 1.8 percent for Washington State as a whole.

TABLE 1

POPULATION, BY COUNTY AND INCORPORATED PLACES, YAKIMA VALLEY ECONOMIC 3-COUNTY AREA

COUNTY OR CITY	1940	1950	1960
KITTITAS COUNTY, TOTAL	20230	22235	20467
Cle Elum	2230	2206	1816
Ellensubrg	5944	8430	8625
Kittitas	501	586	536
Roslyn	1743	1537	1283
South CleElum	n.a.	442	383
Unincorporated[a]	9812	9034	7824
YAKIMA COUNTY, TOTAL	99019	135723	145112
Yakima Urban Area[b]	n.a.	60648	65608
Yakima City	27221	38486	43284
Union Gap City	976	1766	2100
Unincorporated suburban[b]	n.a.	20396	20224
Grandview	1449	2503	3366
Granger	752	1164	1424
Harrah	n.a.	297	284
Mabton	485	831	958
Moxee City	335	543	499
Naches	536	633	680
Selah	1130	2489	2824
Sunnyside	2368	4194	6208
Tieton	n.a.	620	479
Toppenish	3683	5265	5667
Wapato	1483	3185	3137
Zillah	803	911	1059
Unincorporated outside Yakima urban area[a]	n.a.	52440	52919
BENTON COUNTY,TOTAL	12053	51370	62070
BENTON COUNTY INSIDE YAKIMA VALLEY, TOTAL	n.a.	8697	11631
Benton City	n.a.	863	1210
Prosser	1719	2636	2763
West Richland	n.a.	n.a.	1347
Unincorporated portion of CCD's 12, 13, 14[a]	n.a.	5198	6311
TOTAL, YAKIMA VALLEY[c]	n.a.	160655	177210
BENTON COUNTY, OUTSIDE YAKIMA VALLEY, TOTAL	n.a.	42673	50439
Kennewick	1918	10106	14244
Richland	n.a.	21809	23548
Unincorporated	n.a.	10758	12647
TOTAL, YAKIMA 3-COUNTY AREA[d]	131302	209328	227649

a/ Includes all unincorporated areas as of year shown, including portions marked "n.a." (not available) which were later incorporated.

b/ Defined to include Yakima County 1960 census divisions 9,10,11,12,15,16, 17, 18,19, and Yakima City. Included within these divisions are the City of Union Gap and the unincorporated communities of Fairview, Fruitvale, South Broadway and Sumach.

c/ Includes all of Kittitas and Yakima Counties and Census County Divisions 12,13,14 and "Prosser" in Benton County.

d/ Includes all of Kittitas, Yakima and Benton Counties.

Source: U. S. Census of Population, 1940, 1950, 1960, April 1.

Kittitas County--Population declined about 8 percent during the 1950-60 decade. The city of Ellensburg, where the Central Washington State College is located, grew slightly, but all other cities and the unincorporated area declined in population.

Benton County--All of the cities and also the unincorporated areas increased in population during the 1950-60 decade. The portion within the Yakima River Basin increased at an annual rate of 2.9 percent, and the portion outside the basin increased at an annual rate of 1.7 percent.

Estimates of county population, as of July 1, 1964, are:[1/]

County	April 1, 1960	July 1, 1964	Average annual Rate of Change, %
Benton	62070	66000	1.5
Kittitas	20467	22000	1.8
Yakima	145112	147100	0.3
TOTAL, 3-County Area	227649	235100	0.8

1/ Source for the July 1, 1964 estimates is Washington State Department of Health, Public Health Statistics Section, Olympia, Wash., publication PHS 9/29/64.

C. Projected Economic Base and Population

1. Future Increases in Output and Employment of Major Industries

a. Summary

The economy of the Yakima Valley is heavily dependent upon agriculture and food processing, with some additional specialization in lumber and wood products manufacturing, trucking, warehousing and wholesaling, and education. Future growth of the Valley's economy and population will depend primarily upon expansion of these same industries. The only other growth factors foreseeable are the possibilities of increased employment in services connected with recreation, the spillover effects that would be felt from further development and diversification at Hanford, the proposed development of coal mines near Cle Elum, and the stimulus that might result if barge navigation on the Columbia River is extended to Wenatchee.

b. Agriculture

(1) Agricultural acreage. It is assumed that there will be no significant increase in total acreage, but that irrigated acreage will increase slowly during the study period.[1/] A rate of growth in irrigated acreage of 0.2 percent per year has been adopted for this study. This corresponds to the rate of growth in irrigated cropland projected for Benton, Kittitas and Yakima Counties for the period 1958-1975 by the Soil and Water Conservation Needs Inventory.[2/] The 0.2 percent per year rate

---

1/ No large increase in irrigated acreage is expected, because water rights on existing irrigated acreage are inadequate for low-flow years. Increases in available water would probably be used first to firm up irrigation on present acreage.

2/ This report was published in April, 1962 by the Washington Conservation Needs Committee, of which the Soil Conservation Service was chairman. The report projected an increase in irrigated cropland of about 17,000 acres in the 3-County Area from 1958 to 1975.

is slightly higher, though not far different, than the rate of growth in irrigated acreage in the Yakima Basin projected in the CBIAC North Cascade Mountains Study.[1/] There appears to be ample irrigable acreage not yet irrigated to allow for the increase at the rate adopted here, if water can be made available.[2/]

(2) Domestic Animal Populations. During recent years, there has been a marked increase in cattle production in the Yakima Valley. Most of the production is in feed yards. Cattle feeding is steadily growing in importance. In Yakima County alone, there are now about 125 feed lots, the largest number in any county in the state.[3/] The data in Table 7 show that cattle (other than milk cows) in the 3-County Area increased from 183,487 in 1954 to 198,211 in 1959. Historical data show that this is part of a long-term trend.[4/] For purposes of this study, it is assumed that cattle population in the Yakima Valley will increase at about the rate projected for the population of Washington State, or about 2.0 percent per year.[5/] That same rate of increase has also been assumed for hogs and pigs, whose number in the 3-County Area increased substantially from 1954 to 1959. In the case of poultry, an increase in chicken population in Yakima County from 1954 to 1959 was more than offset by decreases in Benton

1/ CBIAC, North Cascade Mountains Study, January 1964, Part II, section D, page 4, shows irrigated acreage in the Yakima Basin of 498,000 acres in 1963, projected to reach 513,000 acres in 1985 and 528,000 acres in 2010. This would represent an average annual rate of increase during the entire period of about 0.13 percent.

2/ According to E. F. Eldridge, Return Irrigation Water, U.S.P.H.S., Portland, Oregon, May 1, 1960, page 65, the Yakima Basin contains a potential of 621,000 irrigable acres. On a somewhat different basis of classification, the North Cascade Mountains Study referred to in note 3 above (Part II, section D, page 2) estimated that total irrigated and potentially irrigable acreage in the Yakima Basin was 528,000 acres. This was also the number of acres which that report estimated would be under actual irrigation by 2010.

3/ Yakima County Agriculture, Washington State Dept. of Agriculture, 1964, p. 54.

4/ Ibid., p. 55.

5/ Based upon projections of Washington State population adopted in May 1964 by the Economics Subcommittee of CBIAC.

and Kittitas Counties. However, it is assumed that the recent increasing trend in Yakima County is likely to be dominant in the future, due to the large population increases projected for the Northwest. Poultry production will be encouraged not only by this increasing demand, but also by the fact that there is a good local supply of feed crops and a dry climate. In addition to chickens, turkey production is now important in the Yakima Valley. Yakima County turkey production increased 10 percent from 1954 to 1959, and the county leads all counties in the state in turkeys raised.[1/] Competition from other parts of the country which specialize in poultry production may impede the growth of the industry in the Yakima Valley, and, for purposes of projection, it is assumed that poultry numbers in the Yakima Valley will increase at only half the rate expected for State population, or at about 1.0 percent per year. This also approximates the rate of increase in poultry production in Yakima County during 1954-59. Dairy cows in the Yakima Valley have been decreasing in numbers in recent years. However, the value of all dairy products sold in the 3-County Area increased from about $5.1 million in 1954 to about $5.3 million in 1959. This was accomplished partly as a result of an increase in yields per cow. In the U. S. as a whole, the number of milk cows has declined about 1.8 percent per year since 1950, but the average yield per cow has increased about 2.5 percent per year, with total milk output increasing about 0.7 percent per year.[2/] In the Yakima Valley, the decrease in number of milk cows shown in Table 7 was about 6 percent per year during

1/ Yakima County Agriculture, op. cit., p. 58.

2/ Statistical Abstract of the U. S., U. S. Dept. of Commerce, 1963, p. 681.

1954-1959. Increasing costs have made small dairy operations uneconomical in the Yakima Valley. However, the decline in milk cows appears now to have halted with milk cow numbers levelling off at about the 1959 figure.[1/] For purposes of projection, it is assumed in this report that future improvements in yield per cow will be marginal, and that the number of milk cows in the Yakima Valley will slowly increase, as a result of growing population in the Valley itself and in the Northwest, at 0.5 percent per year. On the basis of the growth rates assumed above, animal populations in the Yakima 3-County Area in the future would be as follows:

	1959	1985	2010
Milk Cows	19766	22500	25500
Other Cattle	198211	331700	544200
Hogs and Pigs	25636	42900	70400
Chickens	334503	433300	555600

(3) Agricultural productivity. Future increases in farm production will result not only from some increase in acreage, but also from increases in productivity per acre. In the United States as a whole, productivity per acre in recent decades on all cropland increased about 1.9 percent per year.[2/] Assuming that increase will continue, the increase in the Yakima Basin in the future should at least equal that rate, and probably exceed it, because of the possibilities of increasing the amount of irrigation on acres at present receiving only partial irrigation. It is assumed here that average productivity per acre in the Yakima Basin will increase at two percent per year during the study period.

1/ Yakima County Agriculture, op. cit., p. 55.

2/ This is the average annual rate of increase in crop production per acre during the period 1930-60, as shown in Statistical Abstract, 1962, p. 643.

(4) Agricultural employment. Employment in agriculture in the United States during the last few decades has declined, not only as a percent of the total labor force, but also in absolute terms. In the Yakima 3-County Area, however, this trend has been less pronounced. Agricultural employment there increased from 15,720 in 1940 to 17,403 in 1950, and then declined to 15,211 in 1960.[1/] Bringing additional land under irrigation no doubt helped maintain the number of persons working in agriculture. The number of farmers has also been increased by the Bureau of Reclamation's law that 160 acres is the maximum size of a single farmer's holding of land receiving irrigation water.[2/] It is assumed here that the 160-acre legal requirement will continue in force. Also tending to maintain or increase the number of farmers in the future will be an expected shift of acres into specialty crops, which require a higher labor input per acre than hay or grains. On the other hand, working towards a decrease in agricultural employment is the long-established trend of rising productivity per worker in agriculture. It is assumed that this trend will continue, though at a slower rate than in recent decades. On balance, it is assumed that in the Yakima Valley these factors will be roughly offsetting, so that employment in agriculture will remain about at its present level during the study period.

1/ All of these figures are as of April 1st, and may to some extent reflect variations in seasonal conditions among these years.

2/ It is noteworthy that the average size of farm having irrigation in 1959 was 150 acres in Benton County and 169 acres in Yakima County. In Kittitas County, the average was 585 acres, a difference probably explained by the relatively greater importance of wheat and hay crops in Kittitas County.

c. Food Processing

(1) Output. On the basis of preceding assumptions, the raw material for food processing in the Yakima Valley would increase at about 2.2 percent per year (0.2 percent from increases in acreage, and 2.0 percent from increases in productivity per acre). Additional increases are expected, as a result of diverting irrigated land presently used for hay and grains to specialty crops to be used in freezing and canning. About 30 percent of total irrigated acreage in the 3-County Area was in hay and 26 percent in grains in 1959. Most food processing is based on fruits and vegetables, for which only 37 percent of the irrigated acreage was used in 1959, as shown in Table 6. It is assumed that the combined effect of these factors will be that the raw materials available for food processing, and the output of food processing plants, in the Yakima Valley in 1985 will be about double the 1960 level, and in 2010 about four times the 1960 level. For purposes of this study, it is further assumed that this same growth rate will apply to all crops now processed, so that the relative proportions among the various food products will remain the same in the future as at present. It is assumed here that the growth in food processing will represent expansion at or near existing plants. This assumption might have to be revised if river barge navigation is extended from Pasco to Wenatchee, in which case there might be some advantages in locating plants along the Columbia River.

(2) Employment. A number of factors make it particularly difficult to estimate the future part of the labor force that will be employed in food processing. For example, a substantial part of employment in food processing represents persons who enter the labor force only for the short canning and packing season and then withdraw from it. There is a wide seasonal variation. Another difficulty arises from the fact that employment in food processing is composed of two diverse elements. One consists of the creameries, bakeries, bottling works, etc. which serve the community itself. This employment is related to the size of the local population. The other, and in the case of the Yakima Valley, the larger, part of food processing employment comprises the canning, freezing and preserving of fruits and vegetables for export from the Valley, and is related to the volume of raw material available from the Valley's orchards and cropland. No precise allocation of the Valley's total food processing employment between these two groups is possible on the basis of presently available data.[1/] Taking all food processing as a whole, employment in that industry in the Yakima 3-County Area increased at about 5 percent per year during the period from 1940 to 1960. The rate of increase was about 5.6 percent per year during

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1/ On the basis of employment data for manufacturing firms as reported in the Directory of Washington State Manufacturers, Wash. State Dept. of Commerce and Economic Development, Olympia, Wash., 1964, a rough estimate can be made that about one-fourth of the employment in food processing in the Yakima Valley is engaged in making products for local use.

1940-50 and about 4.6 percent per year during 1950-60.[1] This substantial increase in food processing was due, in large part, to the increase in irrigation resulting from three new projects completed during the 1940-60 period.[2] As indicated in the preceding section on agricultural acreage, it is assumed that future increases in irrigation will come at a slower rate. In the preceding paragraph it has been assumed that raw material from the Valley's orchards and cropland would increase at a rate sufficient to enable food processing output to double in the 25 years from 1960 to 1985 and double again from 1985 to 2010. This would represent an average annual rate of increase of about 2.9 percent. Employment will increase less rapidly than that, however, due to rising productivity per employee. The rate of increase in productivity per employee will vary widely among different foods, processes, and plants. During recent years, in the U. S. as a whole, output per employee

1/ Employment in food and kindred manufacturing in the Yakima 3-County Area, as reported by the U. S. Census of Population for April 1st of the year shown, increased as follows:

County	Employment			Annual Rate of Increase, %		
	1940	1950	1960	1940-50	1950-60	1940-60
Benton	125	185	423			
Kittitas	148	159	195			
Yakima	932	1736	2657			
3-COUNTY TOTAL	1205	2080	3275	5.6%	4.6%	5.0%

2/ Projects completed in the Yakima Basin during the 1940-60 period were the Wapato No. 2 Dam, in 1942; the Chandler Dam in 1956; and the Roza Dam in 1958.

per hour in food manufacturing activities is estimated to have increased at a rate of about 2.7 percent per year.[1/] If such a productivity increase were assumed for the Yakima Valley for the next 25 years, it would mean that nearly all of the projected doubling of food processing output could be handled by the existing labor force. However, it appears likely that the rate of increase in productivity per worker will level off in the future as the more obvious labor-saving improvements have been made. It is also probable that a part of the future increase in output per man-hour will be taken out in increased leisure, if, as appears reasonable, the well-established long-term trend of declining hours of work per week continues. For purposes of this study, it is assumed that employment in food processing in the Yakima Valley will increase at about 1.5 percent per year during the study period. This rate has been used for projecting employment in the "food and kindred" category in Table 9.

1/ Output per man-hour, for production workers only, in food canning and preserving in the U.S. as a whole is estimated to have increased at a rate of about 3.4 percent per year during the period 1950-60, according to data in Statistical Abstract, U. S. Dept. of Commerce, 1963, Table 309, page 238. However, the rate of increase would be lower if clerical and other non-production employees in the industry were included. An estimate of the increase in productivity for all employees in all food manufacturing activities can be derived from data on industrial production. As shown in the Statistical Abstract, Table 1093, page 774, output of food and beverage manufacturers increased from an index of 83 in 1950 (1957-9=100) to 107 in 1960. At the same time, employment in "food and kindred" manufacturing increased only slightly, from 1,790,000 to 1,793,000 (Statistical Abstract, Table 296, page 225). Average hours worked per week in "food and kindred" manufacturing decreased from 41.6 in 1950 (Statistical Abstract, 1958 edition, page 229) to 40.9 in 1960 (Statistical Abstract, 1963, p. 240). Adjusting output for the changes in employment and hours, productivity per employee per hour increased at a rate of about 2.7 percent per year.

d. Lumber and wood products

There appears to be the possibility of expansion in production and employment in this industrial category based upon harvesting species which are not now being cut, such as lodgepole pine, larch, Engleman spruce, mountain hemlock, and alpine fir. This could provide the raw material for manufacture of pulp or hardboard or other wood composition products. Because of the large pulp and paper facilities already well established over the Cascades in western Washington and because the transportation of chips across the mountains from Chelan County has already proved to be economically feasible, it seems unlikely that additional pulp or paper capacity will be built in the Yakima Basin. The most likely use of secondary species manufactured within the Yakima Basin would be for hardboard or particle board. It is assumed, for purposes of estimating industrial wastes, that two such plants will be established during the study period, with Cle Elum and Yakima the most likely sites.[1/] It is assumed that the harvest of major species now being cut in the Yakima Basin will remain about at the present level throughout the study period. The harvest in the national forests is about at the allowable level and it is believed that operations of Boise Cascade Corporation, the principal private operator in the area, are about at the sustained yield maximum.

1/ The estimate of two hardboard or wood composition mills is based on the assumption that the volume of cut of secondary species could equal about one-third of the present volume in primary species. This could provide about 50 million board feet per year, assuming that the cut of primary species in the Yakima Basin is about 160 million board feet. That volume would supply material for two plants each of a capacity of 100-150 tons per day of hardboard.

There can be some increase in employment in this sector, however, due to increases in fabricating of secondary products, though such an increase will be partly offset by increases in output per man-hour.

e. Coal mining

Coal reserves in the Yakima Basin, located in Kittitas County near Roslyn and Cle Elum, are estimated at 241 million tons.[1/] This deposit has been actively mined in the past, primarily for railroad coal. Over 63 million tons have been mined from the deposits to date.[2/] Since the railroad changed to diesel locomotives, however, production has dropped to a low level. Coal mining employment in Kittitas County had declined to about 100 by 1960, from about 600 in 1950, and has further declined since then. But the coal deposits in Kittitas County are of a higher quality than most of the coal found in Washington State, and a tentative proposal has been made by a group of PUDs to re-activate the mines for thermal power purposes. By the late 1970s, electricity requirements will probably require thermal power supplies to supplement hydro power. Whether the coal mines are re-opened for this purpose will depend on the relative cost advantages between coal-fired and nuclear-fired steam power generation. It is assumed in this study, for water resource planning purposes, that a 500,000-kw steam power plant will be in operation near the

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1/ Potential for the Coal Industry in the Pacific Northwest, Preliminary Report, 1964, for Bonneville Power Administration, by U. S. Bureau of Mines & H. Zinder & Assoc., p. 7.

2/ Ibid., p. 33.

coal deposits by 1985. Such a plant would require about 1.3 million tons of coal per year, of the quality found in Kittitas County, and would employ about 300 persons in mining and generating plant operations.[1/] For purposes of projections in this report, it is assumed that the plant will be operating at the same level in 2010. The assumption that such a plant will be built is, however, one which should be re-examined in future years, as cost advantages between coal and nuclear fuels change. Because coal is distributed so widely throughout the United States, with many deposits much closer to markets than the Kittitas location, it appears unlikely that the Kittitas deposit would be used for any other purpose during the period to 2010.

f. Diversified manufacturing

With the growth in the size of the local economy, it is anticipated that there will be a more than proportionate growth in the local manufacture of products now imported into the area. Table 2 shows how the percentage of the labor force in the Yakima Valley in most manufacturing categories falls far below that in the Seattle Region and the United States. It is expected that, with growth, the Yakima Valley will tend to move in the direction of the greater diversification characteristic of the larger areas. This would mean increases in employment in such classifications as fabricated metals, machinery,

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1/ The heat rate of the proposed Cle Elum power plant would be 9000 BTU per kilowatt-hours (Ibid., p. 269, note). The coal in the Kittitas deposits is evaluated at about 12,000 BTU per pound. The employment projection is based upon the assumption (Ibid., p. 290) that productivity will increase in coal mining, due to mechanization, from about 15 tons per man per shift at present in the Pacific Northwest to about 30 tons by 1985. A 225-day mining year is also assumed.

"other durables", and "other non-durables". As shown in Table 9, it it assumed that employment in these groups, taken as a whole, will more than double from 1960 to 1985, with a somewhat slower rate of increase during 1985-2010.

g. Service industries

(1) Trucking, warehousing and wholesali g. It is assumed that Yakima will continue to act as a center for these services and that employment in them will increase with the increase in state population. As shown in Table 9, it is assumed that employment in trucking and warehousing will increase at an average annual rate of about two percent during 1960-85 and 1985-2010. Employment in wholesale trade is included in "all other services", which is projected to increase at an average annual rate of about 1.5 percent during 1960-85 and 1985-2010.

(2) Education. According to a recent economic study for Kittitas County, the state college at Ellensburg doubled in number of students during the past decade and is expected to double again during the next decade.1/ It is assumed here that the growth of the college will continue during the study period, although at a slower rate during the latter part of the period. Thus, the college will contribute increasingly to the economic base of the area. Employment in primary and secondary teaching is expected to continue to increase at a somewhat faster rate than population, constituting one of the factors causing employment in service industries to represent a growing percentage of the total labor force.

1/ Kittitas County Port District, Economic Survey, Kittitas County, 1962, Page G-11.

(3) Recreation. There appear to be possibilities for development of recreation and tourism activities along the eastern slopes of the Cascades. This would add to the economic base of the area and contribute to the increase in employment in "all other services" as shown in Table 9.

2. Future Labor Force

On the basis of the preceding assumptions, an illustrative distribution of the labor force in the Yakima 3-County Area in 1985 and 2010 is given in Table 9. In this illustrative distribution, service industries and diversified manufacturing are projected to increase their shares of total employment. Only a small increase is anticipated in employment in the group comprising agriculture and other "extractive" industries.

3. Estimated Future Population

a. Yakima 3-County Area

Based upon the projected growth in employment discussed in the preceding paragraphs, Table 9 gives an estimate of population in the Yakima 3-County Area in 1985 and 2010. The growth rate for the 3-County Area's population would be 1.3 percent per year during both the 1960-85 and 1985-2010 periods. In calculating the population which it is assumed can be supported by the employment possibilities envisioned, the following factors have been considered:

(1) Unemployment in the Yakima 3-County Area in 1960 was much higher, as a percentage of the total labor force, than in the United States as a whole. This was due to a large extent to the seasonality of the agricultural and food-processing industries in the Yakima Valley. It is assumed in Table 9 that the high rate of unemployment will decline in the future, due both to the diversification projected for the future economy and to the fact that food processing is becoming less seasonal as a result of holding crops in cold storage. The 5 percent unemployment assumed for the Yakima 3-County Area is equal to the present and assumed future rate of unemployment in the U. S. as a whole.

(2) A somewhat smaller percentage of the population in the Yakima 3-County Area was in the labor force in 1960 than in the U. S. as a whole. In the U. S. in 1960, between 40 and 41 percent of the total population were in the labor force. There has been no definite trend

of change in this ratio during recent decades. It is assumed that that ratio will continue in the future for the U. S. as a whole and that the Yakima 3-County Area will tend to become more like the Nation in this respect during the study period. It has been assumed in Table 9 that the percentage of the population in the labor force in the Yakima 3-County Area would increase from 38.3 percent in 1960 to about 39 percent by 2010.

TABLE 9

ESTIMATED FUTURE POPULATION OF THE YAKIMA 3-COUNTY AREA AND AN ILLUSTRATIVE DISTRIBUTION OF THE FUTURE LABOR FORCE, 1960-2010[a/]

Industry Group	Employment, nearest thousand 1960	1985	2010
Agriculture, forest management, fisheries, and mining	15.5	16	17
Manufacturing, Total	14.8	25	37
Logging, lumber, wood prod., furn.[b/]	1.2	2	3
Primary and fabricated metals, machinery, transp. equip., and all other durables	1.2	4	7
Food and kindred products	3.3	5	7
Chemicals and allied	7.4	10[c/]	12[c/]
Textiles, apparel, printing, and other non-durables, and misc. mfr.	1.7	4	8
Trucking and warehousing	1.8	3	5
Education	4.7	8	11
All other services, including construction and "industry not reported"	41.6	61	89
Total Employed Civilian Labor Force	78.4	113	159
Military	1.1	1	2
Total Employed Labor Force	79.5	114	161
Unemployed	7.8	7	8
Unemployed as percent of total employed labor force	(9.8%)	(6.1%)	(5.0%)
Total Labor Force	87.3	121	169
Population (nearest thousand)	228	314[d/]	434[d/]
Total labor force as percent of population	(38.3%)	(38.5%)	(39%)

a/ Includes all of Benton, Kittitas and Yakima Counties.
b/ Includes hardboard, etc.
c/ It is assumed that the Hanford atomic works will continue, with some moderate expansion in employment, and that there will be growth of other more conventional chemical manufacturing, particularly in the field of agricultural chemicals.
d/ Also corresponds to projections in North Cascade Mountains Study, CBIAC, Jan. 1964, Part I, Table 1, page 42.

b. Yakima Valley

As shown in Table 8, the portion of the Yakima 3-County Area's population that was within the Yakima Valley was 79.6 percent in 1950 and 77.8 percent in 1960. Although it is assumed that the Richland-Kennewick area will grow less rapidly in the future than it has in the past, it is anticipated that the population in the Yakima Valley will probably continue to decline slowly as a percentage of the 3-County Area. Here, it is assumed that the Yakima Valley will constitute 76 percent of 3-County Area population in 1985 and 75 percent in 2010. This would mean that population within the Yakima Valley would be:

1960	177,000
1985	239,000
2010	326,000

c. Estimated Future Population in Incorporated Places

The incorporated places in the Yakima Valley, as shown in Table 8, and including the entire Yakima City Urban Area as defined in that table, constituted about 60 percent of total valley population in 1950 and about 62 percent in 1960. It is assumed that this trend will continue and that population in incorporated places in 1985 will represent about 67 percent of valley population in 1985 and about 72 percent in 2010. This would mean that population in incorporated places in the valley would be 160,000 in 1985 and 235,000 in 2010. The growth rate for incorporated places, taken as a whole, would be about 1.6 percent per year during the study period. The bulk of the growth is likely to be in the Yakima Urban Area, with Ellensburg and the Cle Elum-Roslyn area also participating because of the economic base factors discussed above. A study of the economic base of each incorporated place in the

Yakima Valley is beyond the scope of this report. Insofar as the growth experience during the last two decades as shown in Table 8 is a guide, it would appear that many of the smaller incorporated places have very little growth potential. This would be consistent with the tendency throughout the United States in recent decades for the growth rate of cities to be proportionate to their size. Special circumstances can, of course, upset this generalization in individual cases. In Table 10, which must be regarded as simply a working hypothesis for planning purposes, the following growth rates have been assumed for the study period:

City or Area	Annual Growth Rate, %	Factors Influencing Selection of growth Rate
Yakima Urban Area	1.7	Largest city; service industry center for entire basin; diversified manufacturing center.
Ellensburg	1.5	Site of state college.
Cle Elum, So. Cle Elum, Roslyn Area	1.5	Coal mining; potential recreation area; close to secondary timber stands.
Grandview, Granger, Mabton, Selah, Sunnyside, Zellah, Benton City, West Richland	1.5	Relatively high rates of growth during 1940-60 or 1950-60.
Kittitas, Harrah, Moxee City, Naches, Tieton, Toppenish, Wapato, Prosser	0.5	Relatively low rates of growth, or decline in population, during 1940-60 or 1950-60.
Average for all incorporated places	1.6	

Because of the arbitrary nature of the growth rates assumed for the various cities, Table 10 is offered only as a general guide to the order of growth that would be consistent with recent trends and with

the projected population of the valley as a whole. A factor increasing the arbitrary nature of population projections for incorporated places is that new incorporations may occur or the rate of annexation to existing cities may change.

d. Estimated Future Population by Service Areas

In order to facilitate planning for water supplies and waste disposal, the Yakima Valley has been divided into six service areas, and the projected future population of the Valley has been distributed among these areas, as shown in Table II. The distribution of unincorporated population has been made on the basis of a judgment as to the potential for expansion of agriculture in the various areas and the probabilities of growth in suburban population.

TABLE 10

ILLUSTRATIVE PROJECTIONS OF FUTURE POPULATION IN INCORPORATED PLACES
YAKIMA VALLEY

(Population to nearest thousand)

City or Area	1960	1985	2010
Kittitas County:			
Cle Elum, South Cle Elum, and Roslyn (total population)	3.5	5.0	7.4
Ellensburg	8.6	12.5	18.1
Kittitas	.5	.6	.7
Yakima County:			
Yakima Urban Area[a/]	65.6	100.0	153.0
Grandview	3.4	4.9	7.2
Granger	1.4	2.0	2.9
Harrah	.3	.3	.4
Mabton	1.0	1.4	2.0
Moxee City	.5	.6	.7
Naches	.7	.8	.9
Selah	2.8	4.1	5.9
Sunnyside	6.2	9.0	13.0
Tieton	.5	.6	.7
Toppenish	5.7	6.4	7.3
Wapato	3.1	3.6	4.0
Zillah	1.1	1.5	2.2
Benton County (portion in Yakima Basin):			
Benton City	1.2	1.7	2.3
Prosser	2.8	3.1	3.5
West Richland	1.3	1.9	2.8
TOTAL, INCORPORATED PLACES IN YAKIMA BASIN	110.2	160.0	235.0

a/ For definition of Yakima Urban Area, see Table 8 footnote[b/].

TABLE 11

PROJECTED FUTURE POPULATION IN THE YAKIMA VALLEY, BY SERVICE AREAS
(Population to nearest thousand)

Area	1950	1960	1985	2010
Cle Elum - Roslyn Area[a]	6.5	4.8	6.7	9.5
Incorporated places[b]	4.2	3.5	5.0	7.4
Unincorporated	2.3	1.3	1.7	2.1
Ellensburg - Kittitas Area[c]	15.7	15.7	21.6	29.3
Incorporated places[d]	9.0	9.2[m]	13.1	18.8
Unincorporated	6.7	6.5	8.5	10.5
Naches - Yakima - Moxee City Area[e]	84.6	89.2	128.1	186.1
Incorporated places[f]	64.9	70.1	106.1	161.2
Unincorporated	19.7	19.1	22.0	24.9
Wapato - Toppenish Area[g]	28.0	28.5	33.4	38.7
Incorporated places[h]	9.7	10.1[m]	11.8	13.9
Unincorporated	18.3	18.4	21.6	24.8
Sunnyside - Grandview Area[i]	23.1	27.4	35.4	45.9
Incorporated places[j]	8.7	12.0	17.3	25.1
Unincorporated	14.4	15.4	18.1	20.8
Prosser - Benton City Area[k]	8.7	11.6	13.8	16.5
Incorporated places[l]	n.a.	5.3	6.7	8.6
Unincorporated	n.a.	6.3	7.1	7.9
TOTAL YAKIMA VALLEY	166.6	177.2	239.0	326.0
Incorporated places	n.a.	110.2	160.0	235.0
Unincorporated	n.a.	67.0	79.0	91.0

a/ Kittitas County Census Divisions 2, 3, 4, 5, and 6.
b/ Roslyn, Cle Elum, and South Cle Elum.
c/ Kittitas County Census Divisions 1, 7, 8, 9, 10, and Ellensburg.
d/ Kittitas and Ellensburg.
e/ Yakima County Census Divisions 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, Selah and Yakima.
f/ Includes Yakima and Union Gap, and certain unincorporated suburban area as defined in footnote "b" in Table 8, and also Tieton, Naches, Selah, and Moxee City.
g/ Yakima County Census Divisions 21, 22, 23, 24, 25, 26, 27, 33, 34, 35, 36, 37, 39, 40, Toppenish and Wapato.
h/ Harrah, Toppenish, Wapato, and Zillah.
i/ Yakima County Census Divisions 28, 29, 30, 31, 32, 38, and Sunnyside.
j/ Grandview, Granger, Mabton and Sunnyside.
k/ Benton County Census Divisions 12, 13, 14, and Prosser.
l/ Benton City, Prosser, West Richland.
m/ Differs from data shown in Table 10 because of rounding.